**Algebra 2**

Linear Programming-practice

**1.)** The area of a parking lot is 600 square meters. Each car requires 6 square meters and each bus requires 30 square meters. The attendant can handle only 60 vehicles. If a car is charged $2.50 and a bus is charged $7.50, how many of each should be accepted to maximize income?

**2.)** Michael is an artist who specializes in geometric designs. He is trying to get ready for a street fair next month.

Michael paints both watercolors and pastels. Each type of picture takes him about the same amount of time to paint. He figures he has time to do a total of at most 16 pictures.

The materials for each pastel will cost him $5 and the materials for each watercolor will cost him $15. He has $180 to spend on materials. He makes a profit of $40 on each pastel and a profit of $100 on each watercolor.

1. Express each of Michael’s constraints as inequalities, using ***P*** to represent the number of pastels and ***W***to represent the number of watercolors.
2. Make a full page graph that shows Michael’s “feasible region”. In other words the graph should show all the combinations of watercolors and pastels that satisfy his constraints.
3. Write an algebraic expression to represent Michael’s profit in terms of *P* and *W.*
4. How many watercolors and how many pastels should Michael paint in order to maximize his profit?

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**3.)** Hard Rock Productions is planning its next month’s work. The company makes CDs of both rock and rap music.

It cost the company an average of $15,000 to produce a rock CD and an average of $12,000 to produce a rap CD. It takes about 18 hours to produce a rock CD and about 25 hours to produce a rap CD.

The company can afford to spend up to $150,000 on production next month. Also, according to its agreement with the employee union, the company must spend at least 175 hours on production.

Hard Rock Productions earns $20,000 in profit on each rock CD it produces and $30,000 in profit on each rap CD it produces. The company recently promised its distributor that it would not release more rap than rock, because the distributor thinks that company is more closely associated with rock in the public mind.

1. Express each of constraints as inequalities, using ***K*** to represent the number of rock CDs and ***P***to represent the number of rap CDs.
2. Make a full page graph that shows “feasible region”.
3. Write an algebraic expression to represent companies profit in terms of *K* and *P.*
4. Find the number of rock CDs and the number of rap CDs that should company produce in order to maximize their profit?

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**4.)** A hospital dietitian must supply a diet which includes at least 36 grams of protein, 24 grams of carbohydrate, and 16 grams of fat. Theses requirements can be met with a mixture of two foods, Yummy Yuk, which costs $20 per ounce, and Mostly Mush, which costs $16 per ounce.

* Each ounce of Yummy Yuk supplies 9 grams of protein, 3 grams of carbohydrates, and 1 gram of fat.
* Each ounce of Mostly Mush supplies 2 grams of protein, 2 grams of carbohydrates, and 2 grams of fat.

The dietician is also under orders to hold costs to a minimum. What mixture of these two foods should be used to meet the dietary requirements and **minimize** costs?

**5.**) The Elite Tweet pottery shop budgets a maximum of $1000 per month for advertising. The business always uses both newspaper and radio advertising. The newspaper charges $50 per ad and requires at least four ads per month. The radio station charges $100 per minute and requires a minimum of five minutes of advertising per month. It is estimated that each newspaper ad reaches 8,000 people and that each minute of radio advertising reaches 15,000 people. What combination of newspaper and radio advertising should the business use in order to reach the maximum number of people? (The maximizing equation is written from the number of people!)

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**6.)** BIG STATE U

The Admissions Office at Big State University needs to decide how many in-state students and how many out-of-state students to admit to the next class. Like many universities, Big State U has limited resources, and budget considerations have to play a part in admissions policy.

Here are the constraints on the Admissions Office decision:

* The college president wants this class to contribute a total of at least $2,500,000 to the school after it graduates. In the past, Big State U has gotten an average of $8,000 in contributions from each in-state student admitted and an average of $2,000 from each out-of state student admitted.
* The faculty at the college wants entering students with good grade-point averages. Grades of in-state students average less than grades of out-of-state students. Therefore, the faculty is urging the school to admit at least as many out-of-state students as in-state students.
* The housing office is not able to spend more than $85,000 to cover costs such as meals and utilities for students in dormitories during vacation periods. Because out-of-state students are more likely to stay on campus during vacations, the housing office needs to take these differences into account. In-state students will cost the office an average of $100 each for vacation-time expenses, while out-of-state students will cost an average of $200 each.

The college treasurer needs to minimize educational costs. Because students take different courses, it costs an average of $7,200 a year to teach an in-state student and an average of $6,000 a year to teach an out-of-state student.

Your job is to recommend how many students for each category should be admitted to Big State U. You need to minimize educational costs, as the treasurer requires, within the constraints set by the college president, the faculty, and the housing office.